A PROVISIONAL KEY TO THE SHRIMPS OF THE FAMILY PENAEIDAE WITH ESPECIAL REFERENCE TO AMERICAN FORMS

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INTRODUCTION

During the course of the work carried on by the Shrimp Investigations of the Fish and Wildlife Service of the Department of the Interior throughout the past 12 years, it became necessary to prepare a diagnostic key to the species of the shrimps of the Family Penaeidae. As no sufficiently comprehensive key was in existence, one was prepared in order to be able to identify readily the thousands of specimens of a number of species critically examined in the course of the investigation.

The family Penaeidae, from a commercial point of view, is by far the most important family of all the shrimps. In the United States of America it accounts for practically the entire catch which amounts to approximately 150,000,000 pounds annually. Likewise, the family supports a majority of the shrimp fisheries in the remainder of the Americas.

Martin D. Burkenroad, of the Bingham Oceanographic Laboratory, New Haven, Connecticut, has done more to straighten out the confusion existing in the classification of the Penaeidae than any other person who has worked with the family in recent years. We have followed his major groupings, subfamilies, series, and genera, as well as his placement of species in the various genera.

Our key is very largely based on data derived from Burkenroad's published works, in part on the work of others, and on studies which we have made on material at hand and in the collections of the United States National Museum. Secondary sexual characters, which provide one of the best means for the separation of many species, have not been used extensively, for to properly do so would require illustrations. For these details reference should be made to pertinent literature, much of which appears in the "Literature Cited." No doubt errors will be found in some of the characters employed, and others will be found inadequate.

Because a great deal of tedious work and considerable original research have been required for the compilation of this key, it was decided to follow the suggestion of Dr. Waldo L. Schmitt, of the U. S. National Museum, that it be made available for what it it worth to others interested in the problems with which we have been confronted, and in the Family Penaeidae from a taxonomic point of view.

We also wish to acknowledge the helpful cooperation extended us on all occasions by the authorities of the United States National Museum.

KEY TO SUB-FAMILIES OF THE FAMILY PENAEIDAE

I. Post orbital spine present. Cervical sulcus extending nearly or to the dorsum of the carapace. Tuft of setae on proximal margin of propodus of first pereiopods. Pleurobranchs present behind IX. Scale at external angle of ocular somite. Epipodites on all coxae from VIII through XIII.
SOLENOCERINAE Wood-Mason and Alcock

II. Post orbital spine absent.
A. Tuft of setae on proximal margin of propodus of first pereiopods. Pleurobranchs present behind IX. Exopodites present on the maxillipeds and pereiopods.
a. Distinct median tubercle on ocular peduncle. Epipodites on all coxae from VIII to XIV. No scale at external angle of ocular somite. A functional, filamentose anterior arthrobranch on XIII. Cervical sulcus usually extending to dorsum of carapace.
ARISTAEINAE Alcock

aa. No median tubercle on ocular peduncle. Epipodites absent behind XII. Scale present at external angle of ocular somite. No functional filamentose anterior arthrobranch on XIII except reduced form in *Artemesia*. Cervical sulcus does not extend to dorsum of carapace.
PENAEINAE Burkenroad

AA. Tuft of setae absent from proximal margin of propodus of first pereiopods. Pleurobranchs absent behind IX. Exopodites absent from the maxillipeds and pereiopods. No scale at external angle of ocular somite.
EUSICYONINAE Burkenroad

KEY TO GENERA OF SUB-FAMILY SOLENOCERINAE WOOD-MASON

I. Antennular flagella flattened or hollowed out, channel-like in structure.
Solenocera Lucas

II. Antennular flagella cylindrical and filiform.
A. Podobranchs present on segments posterior to VIII. Telson with several pairs of mobile lateral spines forward the distal fixed pair. Prosartemia of inner edge basal segment of antennular peduncle but a rigid short projection.
Haliporus Bate

AA. Podobranchs absent behind VIII. Only a single pair of lateral telson spines. Prosartemia of inner edge basal segment of antennular peduncle a long flexible scale.
Hymenopenaeus Smith

KEY TO THE SPECIES OF THE GENUS *Solenocera* LUCAS

Branchiostegal and pterygostomian spines absent.
A. Tooth or spine present on the externodistal margin of the exopod of the uropod.
a. With dorsal carapacic spine posterior to the cervical groove.
S. steindachneri (Balss)—Indo Pacific

aa. Without dorsal carapacic spine posterior to the cervical groove.
1. Postrostral carina not crossing the level of the cervical groove.
S. weymouthi Linder and Anderson[1]—Atlantic American

2. Postrostral carina extending nearly to the posterior margin of the carapace.
S. melantho DeMan—Indo Pacific

AA. Tooth or spine absent from the externodistal margin of the exopod of the uropod.
a. Spine present on cervical groove ventral to posteriormost spine of rostral series.
S. hextii Wood-Mason—Indo Pacific

aa. Spine absent from cervical groove.
1. Postrostral carina reaching to posterior portion of the carapace. Small spine or tooth present in orbital angle.
S. koebeli DeMan—Indo Pacific

2. Postrostral carina not extending behind level of cervical groove. No spine or tooth in orbital angle.
a′. Petasma of male with series of large comblike spines on outer surfaces of distolateral lobes.
S. pectinatus (Bate)—Indo Pacific

a′a′. Petasma of male without series of large combline spines on outer surfaces of distolateral lobes.
S. rathbuni Ramadan—Indo Pacific

Branchiostegal spine present but without a pytergostomian spine.
A. Telson without lateral armature.
S. crassicornis H. Milne Edwards—Indo Pacific

[1] According to Burkenroad (correspondence) it is likely that this species is identical *Hymenopenaeus tropicalis* (Bouvier).

AA. Telson with lateral armature.
a. No tooth or spine in orbital angle.
S. faxoni DeMan—Indo Pacific

aa. With tooth or spine in orbital angle.
S. annectans Wood-Mason and Alcock—Indo Pacific

III. Pterygostomian spine present but without a branchiostegal spine.
A. Species limited to Atlantic America.
a. Rostral teeth 8 to 10, usually 9. Postrostral carina high and sharp, deeply notched at level of cervical groove.
S. vioscai Burkenroad

aa. Rostral teeth 5 to 7, usually 6. Postrostral carina low or absent, only slightly depressed at level of cervical groove.
1. Antennal scale long, exceeding antennular peduncle by at least 13 per cent its own length. No well defined tooth at orbital angle. Pterygostomian spine large with wide base, joining carapace in a gentle curve.
S. necopina Burkenroad

2. Antennal scale short, less than antennular peduncle to exceeding antennular peduncle by about 8 per cent of its own length. A well defined tooth at orbital angle. Pterygostomian spine small with narrow base, joining carapace at approximately a right angle.
S. atlantidis Burkenroad

AA. Species limited to Eastern Atlantic and South Africa.
a. Cervical sulcus bending ventrad in a sharp angle at its anteroventral termination.
S. membranacea (H. Milne Edwards)—Eastern Atlantic

aa. Cervical sulcus does not curve sharply at its anterior end.
S. m. africanus Stebbing—South Africa

Considerable confusion seems to prevail as to the identity of specimens that have been called *S. africanus* Stebbing.

AAA. Species limited to the Indo Pacific.
a. Hepatic spine placed very low on sides of carapace. Orbital angle dentiform.
S. novae-zealandiae Borradaile

aa. Hepatic spine not placed very low on sides of carapace. Orbital angle not dentiform.
S. comatus Stebbing—Indo Pacific

AAAA. Species limited to Pacific America.
a. Rostral teeth 8 to 10, usually 9. Peterygostomian spine joining carapace in a gentle curve.
S. agassizii Faxon

aa. Rostral teeth 6 to 8, usually 7. Peterygostomian spine joining carapace at approximately a right angle.
1. 13th sternite of female acutely concave on the posterior margin. Petasma of male with median lobule of distolateral lobe a subrectangular shape.
S. florea Burkenroad

2. 13th sternite of female rounded convex on posterior margin. Petasma of male with median lobule of distolateral lobe a subtriangular shape.
S. mutator Burkenroad

KEY TO THE SPECIES OF THE GENUS *Haliporus* BATE

A parapeneid spine present on the median margin of the basal segment of the antennular peduncle. Merus of first legs armed with a stout spine.
H. thetis Faxon—Pacific Ocean

No parapeneid spine present on the median margin of the basal segment of the antennular peduncle. Merus of first legs without a stout spine.
H. curvirostris Bate—Pacific Ocean

KEY TO THE SPECIES OF THE GENUS *Hymenopenaeus* SMITH

Branchiostegal and pterygostomian spines absent. No postrostral teeth separated from the rostral group.
A. Epipods of VIII and IX furcated.
H. tropicalis (Bouvier)—Atlantic America

AA. Epipods of VIII and IX not furcated.
H. mulleri (Bate)—Atlantic America

Branchiostegal spine present, pterygostomian spine absent. No postrostral teeth separated from the rostral group.
A. Orbital angle with tooth or spine.
H. robustus Smith—Atlantic America

AA. Orbital angle without tooth or spine.
a. Merus of first legs not armed. Species limited to Atlantic America.
H. modestus Smith

aa. Merus of first legs armed with a stout spine. Species limited to Indo Pacific.
H. lucasii Bate

III. Pterygostomian spine present, branchiostegal spine absent. One postrostral tooth that is separated from the rostral group.
A. Species occurring in South African waters.
a. One species, ***H. triarthrus*** (Stebbing).

AA. Species occurring in Pacific
a. Merus of first legs armed with a stout spine.
H. diomedeae (Faxon)

aa. Merus of first legs unarmed.
H. sibogae (DeMan)

IV. With branchiostegal spine, with or without pterygostomian spine. With two postrostral teeth separate from the rostral group.
A. With pterygostomian spine.
a. Species occurring in the Atlantic.
1. One species, ***H. laevis*** (Bate).

aa. Species occurring in Pacific America.
1. Two species, ***H. mereus*** (Faxon) and ***H. doris*** (Faxon). Separation of these two forms is not attempted but ***H. doris*** has been figured with a tooth on the postrostral carina posterior to the cervical suture.

AA. Without pterygostomian spine.
a. Species occurring in the Atlantic
1. Eye from dorsolateral view with respect to shape of cornea and position of tubercle as figured by Burkenroad 1936, page 113. No photophores present.
H. aphoticus Burkenroad

2. Eye from dorsolateral view with respect to shape of cornea and position of tubercle as figured by Burkenroad 1936, page 123. Photophores present.
H. debilis Smith

aa. Species occurring in the Indo Pacific.
1. Third and possibly first and second pleonic somites carinated.
H. propinquus (DeMan)

2. First, second and third pleonic somites not carinated.
a′. First leg with basis unarmed.
H. aequalis (Bate)

a'a'. First leg with basis armed.

1'. Fourth, fifth and sixth pleonic somites with posteriomedian dorsal tooth. Ischium unarmed.

H. neptunus (Bate)

2'. Fourth and fifth pleonic somites without posteriomedian dorsal tooth. Ischium armed.

H. obliquirostris (Bate)

V. Branchiostegal and pterygostomian spines both present. No postrostral teeth separate from the rostral group.

H. villosus (Alcock and Anderson), Pacific

VI. With pterygostomian spine, without branchiostegal spine. No postrostral teeth separate from the rostral group.

H. taprobanensis (Alcock and Anderson), Pacific

KEY TO SERIES OF THE SUB-FAMILY ARISTAEINAE ALCOCK

I. Distal, filamentous portion of the superior antennular ramus extensively developed.

Series **Benthesicymae** Bouvier

II. Distal, filamentous portion of the superior antennular ramus not extensively developed.

Series **Aristeae** Bouvier

KEY TO GENERA OF THE SERIES BENTHESICYMAE BOUVIER

I. Fourth and fifth legs with dactyls long and multiarticulated (similar to *Xiphopenaeus*).

Benthonectes Smith

II. Dactyls of the fourth and fifth legs not long and multiarticulated.

A. Podobranchs lacking behind VIII. Gill of somite VII reduced to a vestige. Telson armed with only a single pair of mobile lateral spines.

Gennadas Bate

AA. Podobranchs present on somites VIII to XII. Gill of VII not reduced to a vestige. Telson armed with more than a single pair of mobile lateral spinules.

a. "Pleonic terga in advance of XX uncarinated. Exopod of the first maxillipede without a constricted, segmented distal portion. Telson with more than a single pair of mobile lateral spinules but without a posteriomedian point."[2]

Bentheogennema Burkenroad

[2]Burkenroad, 1936, page 56.

aa. "Pleonic terga in addition to that of XX carinated. Exopod of the first maxillipede distally constricted and segmented. Telson with four pairs of mobile lateral spinules: a small posteriomedian point usually present."[3]

Benthesicymus Bate

THE GENUS *Benthonectes* SMITH

1 species—***B. filipes*** Smith. East Coast of United States and Pacific.

KEY TO SPECIES OF THE GENUS *Gennadas* BATE[4]

"It is found that in all species of *Gennadas* with independent spermathecal orifices the distolateral lobe of the petasma is entire, not sub-divided; whereas in all species with orifices contained within a common atrium, the distolateral lobe is bifurcated. The subdivision of the genus here proposed is based upon this correlation.

A Key to the Adult Petasma and Thelycum of the Species of ***Gennadas*** Bate[5]

Group I. Male. Distolateral lobe of the petasma undivided.
Female. Orifices of the seminal receptacles opening independently, not included in a common atrium.

IA. Male. Distoventral lobe of the petasma undivided.
Female. Orifices of the receptacles not guarded posteriorly by large and conspicuous prominences. Orifices widely separated, the distance between them as great or greater than that between the apertures and the anterior margin of sternite XIV.

IA1. Male. Distolateral lobe not so wide as the distoventral; accessory lobe of petasma projecting far above the distal margin.
Female. Unknown.

1. ***G. sordidus*** Kemp; Balss, 1927 (male).

IA2. Male. Distolateral lobe much wider than the distoventral; accessory lobe not reaching above the distal margin.

IA2a. Male. Both lobules of the distomedian lobe armed with truncated spines; accessory lobe slender and clavate, arising far mediad the lateral margin of the distomedian lobe.

[3]Burkenroad, 1936, page 23.
[4]All of the following material relative to *Gennadas* is copied direct from Burkenroad 1936, pages 64-66.
[5]Dated references are to works of previous students containing satisfactory figures of the species in question. Bracketed references to numbered figures indicate illustrations in the present paper.

Female. Transverse elevation of the poterior margin of XII w-shaped; XIII without a rectangular elevation.

2. ***G. capensis*** Calman, 1925, male [female, figure 53, p. 70].

IA2b. Male. Median lobule only of the distomedian lobe armed; accessory lobe broad, arising laterad the lateral margin of the distomedian lobe.
Female. Transverse elevation at the posterior margin of XII A-shaped; XIII with a conspicuous rectangular elevation the anterolateral corners of which overlap the posterior lips of the orifices of the sperm-receptacles.

3. ***G. kempi*** Stebbing, Balss, 1927, male [female, figure 54, p. 70.]

IB. Male. Distoventral lobe of the petasma divided.
Female. Orifices of the sperm receptacles guarded posteriorly by large and conspicuous prominences; orifices not widely separated, distance between them less than that between apertures and anterior margin of XIV.

IB1. Male. Distomedian lobe not reaching so far distad as the distoventral; accessory lobe much less than half as broad as the distoventral.
Female. Posterior portion of XIII, behind the level of the posterior lips of the spermathecal orifices, without a shield-shaped median elevation with anteriorly directed apex.

4. ***G. elegans*** (Smith), 1882, male [female, figure 55, p. 70].

IB2. Male. Distomedian lobe reaching farther distad than the distoventral; accessory lobe more than half as wide as the distoventral.
Female. Posterior portion of XIII with strong anteriorly directed median elevation.

IB2a. Male. Cleft between the lobules of the divided distoventral lobe extending farther proximad than the cleft between the distoventral and distolateral lobes.
Female. Apex of the median plate of XIV considerably overlapping the base of the median plate of XIII.

5. ***G. brevirostris*** Bouvier; Balss, 1927, male and female (sub ***G. similis***).

IB2b. Male. Cleft of the distoventral lobe not so deep as that between distoventral and distolateral.
Female. Median plate of XIV not overlapping that of XIII.

IB2b(1). Male. Distolateral lobe broader than the distoventral, and reaching as far distad as it does; accessory lobe smaller than the distolateral, and entire.
Female. XIV without a median longitudinal ridge.

6. ***G. tinayrei*** Bouvier, 1908, male [female, figure 56, p. 70.]

IB2b(2). Male. Distolateral lobe much narrower than the distoventral, and not reaching so far distad as does the latter; accessory lobe much larger than the distolateral, and tripartite.
Female. Elevation of XIV with a median longitudinal ridge.

7. ***G. parvus*** Bate; Balss, 1927, male and female.

Group II. Male. Distoventral and distolateral lobes of the petasma both divided.
Female. Orifices of the sperm receptacles lying within a common atrium.

IIA. Male. Lobules of the distolateral lobe subequal in breadth.
Female. A transverse pair of conspicuous tooth-like projections on XIII.

IIA1. Male. Lobules of the distolateral lobe curved toward one another and acuminated.
Female. Posterior margin of XII produced backward over XIII, as a large free flap buttoned into place by the widely separated pair of projections of XIII.

8. ***G. bouvieri*** Kemp, 1909, female; Balss, 1927, male (sub. ***G. alcocki***).

IIA2. Male. Lobules of the distolateral lobe not hooked and acuminated.
Female. Posterior lip of XII not much produced; projections of XIII extending to or nearly to the midline.

IIA2a. Male. Lateral lobule of the distoventral lobe longer than the median; lobules of the distolateral lobe short and stout, the cleft between them not half as deep as that between distoventral and distolateral lobes.
Female. Paired projections of XIII not meeting in the midline; not reaching nearly to the anterior margin of XIII.

9. ***G. valens*** (Smith) 1884, male [female, figure 57, p. 79].

IIA2b. Male. Median lobule of the distoventral lobe longer than the lateral; lobules of the distolateral lobe long and slender, the cleft between them more than half as deep as that between distoventral and distolateral lobes.

Female. Paired projections of XIII meeting in the midline; reaching nearly to the anterior margin of XIII.

10. ***G. gilchristi*** Calman, 1925, male [female, figure 58, p. 79].

IIB. Male. Lobules of the distolateral lobe very unequal in breadth.

Female. No transverse pair of toothlike projections on XIII.

IIB1. Male. Distoventral lobe much longer than the distolateral.

Female. Interspace between the orifices of the sperm receptacles, within the atrium. not elevated as a conspicuous longitudinal ridge; XIII with a single elevation not separated into anterior and posterior parts.

11. ***G. incertus*** Balss, 1927, male (and female, sub ***G. gardineri***).

IIB2. Male. Distoventral lobe much shorter than the distolateral.

Female. Atrium between XII and XIII divided by a well-defined median longitudinal ridge; XIII with distinct anterior and posterior elevated areas.

IIB2a. Male. Lateral lobule of the distolateral lobe much broader than the median one.

Female. Elevated area of XIII weakly separated into a short anterior and a long posterior portion by a shallow transverse sulcus.

12. ***G. talismani*** Bouvier; Balss, 1927, male [female, figure 60, p. 79].

IIB2b. Male. Lateral lobule of the distolateral lobe much narrower than the median.

Female. XIII with distinct anterior and posterior elevations.

IIB2b(1). Male. Lateral lobule of the distoventral lobe broader than the median; median lobule of the distolateral lobe not acuminated.

Female. A free flap projecting forward from the anterior margin of XIV nearly to the anterior margin of XIII.

13. ***G. scutatus*** Bouvier, 1908, male [female, figure 59, p. 79].

IIB2b(2). Male. Lateral lobule of the distoventral lobe narrower than the median; median lobule of the distolateral lobe tapering to a narrow tip.

Female. No free projection from XIV.

14. ***G. propinquus*** Rathbun; Balss, 1927, male (sub ***G. scutatus indicus***); Kemp, 1910 b, female (sub ***G. alcocki***)."

DISTRIBUTION OF SPECIES OF THE GENUS *Gennadas*

G. sordidus Kemp—Indo Pacific
G. capensis Calman—Atlantic
G. kempi Stebbing—?
G. elegans (Smith)—Atlantic
G. brevirostris Bouvier—Atlantic
G. tinayrei Bouvier—Atlantic and Indo Pacific
G. parvus Bate—Indo Pacific-Atlantic
G. bouvier Kemp—Atlantic and Pacific
G. valens (Smith)—Atlantic
G. gilchristi Calman—?
G. incertus Balss—?
G. talismani Bouvier—Atlantic
G. scutatus Bouvier—Atlantic and Pacific
G. propinquus Rathbun—Indo Pacific

KEY TO SPECIES OF THE GENUS *Bentheogennema* BURKENROAD

I. Cervical and post-cervical sutures very closely approximating each other dorsally.

B. pasithea (DeMan)—Pacific

II. Cervical and post-cervical sutures not closely approximating each other dorsally.

A. Cervical and post-cervical sutures not interrupting the postrostral carina.

B. borealis (Rathbun)—North Pacific

AA. Cervical and post-cervical sutures interrupting the postrostral carina.

B. intermedia (Bate)—Atlantic & Pacific

One other species ***B. stephenseni*** Burkenroad, was preliminarily described by Burkenroad 1940. He states it is closely related to ***B. intermedia*** (Bate).—"Dana" Station 3624 I.

KEY TO SPECIES OF THE GENUS *Benthesicymus* BATE[6]

"Sixteen species of the genus (not including the three added in the present paper) have been described, the validity of only seven of which is certain. Aside from the lack of exact knowledge of intraspecific variation which is responsible for the difficulties of synonymy, scant information has been available even as to the differences between the seven clearly distinct species or superspecies. Disregarding for the present the question, whether the ***Benthesicymus brasiliensis*** and ***B. crenatus*** groups contain one or many species, the structural relationships within the genus may be described as follows:

Synopsis of the Genus Benthesicymus

Group I. Thelycum without well-defined receptacles between the twelfth and thirteenth sternites, the scutes of the twelfth and thirteenth sternites being simple and unexpanded. Distoventral lobe of the petasma separated from the distolateral by a deep notch. Median margin of the petasma unarmed, the cincinnuli being borne on a ridge extending up the anterior face of the organ. Exopod of the first maxillipede narrowing abruptly to the segmented distal portion. Merus of the second maxillipede expanded, less than three times as long as broad (except in ***B. strabus,*** n. sp.). Dactyl of third maxillipede triangular, with no more than one strong spine at the tip. Exopodites of the walking legs small but easily perceptible. Pterygostomian spine, in lateral veiw, placed at the margin of the carapace. Pterygostomian carina not sharp.

IA. Posterolateral margins of the fourth pleonic tergite without a comblike series of strong serrae. Antennal carina strong. Cardiacobranchial carina turning ventrally in its posterior part, ending below the posterolateral shoulder of the carapace. First chelipeds without a slender, well-defined tooth at distal ends of basis and ischium.[7]

IA1. Hepatic tooth present. Pterygostomian carina very weak, and not extending posteriorly as far as the level of the hepatic buttress. A moderately strong tooth on the ventrolateral margin of the sixth pleonic segment, just anterior to the postero-ventral angle. Tooth of the first pelonic sternite small or absent. Merus of second maxillipede only moderately expanded, more than two and

[6]All of the following material relative to *Benthesicymus* is copied direct from Burkenroad 1936, pages 23 to 25, 45, 46.

[7]In all of these features the two species of Section IA agree with Group II, except that the antennal carina is there weaker, though variable (ranging in strength from moderate in *B. bartletti* to absent in *B. investigatoris*).

one-half times as long as broad.[8] ***B. brasiliensis*** Bate and related forms (cf. ***B. cereus***).

IA2. Hepatic tooth absent. Pterygostomian carina obtuse but well-defined, and extending far behind the level of the hepatic buttress. No tooth on the ventrolateral margin of the sixth pleonic segment. Tooth of the first pleonic sternite very strong. Merus of second maxillipede considerably expanded, only about twice as long as broad. ***B. carinatus*** Smith

IB. Posterolateral margins of the fourth pleonic tergite with a comblike series of strong serrae. Antennal carina absent. Cardiaco-branchial carina not turning ventrally at its posterior end, terminating at the level of the posterolateral shoulder of the carapace. First cheliped armed on basis and ischium.

IIepatic tooth absent. Pterygostomian carina very weak, and not extending posteriorly as far as the level of the hepatic buttress. A strong tooth on the ventrolateral margins of the sixth pleonic segment. Tooth of the first pleonic sternite very strong. Merus of second maxillipedes strongly expanded, less than twice as long as broad. ***B. crenatus*** Bate[9] and related forms

Group II. Thelycum with well-defined cavities between the twelfth and thirteenth sternites, the scute of the thirteenth sternite being broadly expanded to overlap the sternal surface proper. Distoventral and distolateral lobes of the petasma not sharply separated. Median margin of the petasma cincinnulated. Exopod of the first maxillipede tapering gently to the tip. Merus of the second maxillipede unexpanded, not less than three and one-half times as long as broad. Dactyl of third maxillipede subrectangular, the distal margin bearing more than one strong spine. Exopodites of the walking legs very minute. Pterygostomian spine, in lateral view, set behind the margin of the carapace. Pterygostomian carina very sharply defined.

IIA. Ocular peduncle not much longer than the cornea is broad; ocular tubercle situated near distal end of median margin of peduncle. Scute of the thirteenth sternite of the female posteriorly overlapping the fourteenth sternite, anteriorly not projecting free in the midline. Dis-

[8]In all of these features, the *B. brasiliensis* complex differs from the species of Group II, although in degree of expansion of merus of second maxillipede it approaches Group II more closely than do the other species of Group I.

[9]Diagnosis derived from an Hawaiian male, which differs from Bate's description in several of the features mentioned (see succeeding paragraphs).

[10]The more median part of the distoventral lobe, which in the Benthesicymae surmounts the more lateral portion of the lobe.

IIA2b. Male. Median lobule of the distoventral lobe longer than the lateral; lobules of the distolateral lobe long and slender, the cleft between them more than half as deep as that between distoventral and distolateral lobes.

Female. Paired projections of XIII meeting in the midline; reaching nearly to the anterior margin of XIII.

10. ***G. gilchristi*** Calman, 1925, male [female, figure 58, p. 79].

IIB. Male. Lobules of the distolateral lobe very unequal in breadth.

Female. No transverse pair of toothlike projections on XIII.

IIB1. Male. Distoventral lobe much longer than the distolateral.

Female. Interspace between the orifices of the sperm receptacles, within the atrium, not elevated as a conspicuous longitudinal ridge; XIII with a single elevation not separated into anterior and posterior parts.

11. ***G. incertus*** Balss, 1927, male (and female, sub ***G. gardineri***).

IIB2. Male. Distoventral lobe much shorter than the distolateral.

Female. Atrium between XII and XIII divided by a well-defined median longitudinal ridge; XIII with distinct anterior and posterior elevated areas.

IIB2a. Male. Lateral lobule of the distolateral lobe much broader than the median one.

Female. Elevated area of XIII weakly separated into a short anterior and a long posterior portion by a shallow transverse sulcus.

12. ***G. talismani*** Bouvier; Balss, 1927, male [female, figure 60, p. 79].

IIB2b. Male. Lateral lobule of the distolateral lobe much narrower than the median.

Female. XIII with distinct anterior and posterior elevations.

IIB2b(1). Male. Lateral lobule of the distoventral lobe broader than the median; median lobule of the distolateral lobe not acuminated.

Female. A free flap projecting forward from the anterior margin of XIV nearly to the anterior margin of XIII.

13. ***G. scutatus*** Bouvier, 1908, male [female, figure 59, p. 79].

IIB2b(2). Male. Lateral lobule of the distoventral lobe narrower than the median; median lobule of the distolateral lobe tapering to a narrow tip.

Female. No free projection from XIV.

14. ***G. propinquus*** Rathbun; Balss, 1927, male (sub ***G. scutatus indicus***); Kemp, 1910 b, female (sub ***G. alcocki***)."

DISTRIBUTION OF SPECIES OF THE GENUS *Gennadas*

G. sordidus Kemp—Indo Pacific
G. capensis Calman—Atlantic
G. kempi Stebbing—?
G. elegans (Smith)—Atlantic
G. brevirostris Bouvier—Atlantic
G. tinayrei Bouvier—Atlantic and Indo Pacific
G. parvus Bate—Indo Pacific-Atlantic
G. bouvier Kemp—Atlantic and Pacific
G. valens (Smith)—Atlantic
G. gilchristi Calman—?
G. incertus Balss—?
G. talismani Bouvier—Atlantic
G. scutatus Bouvier—Atlantic and Pacific
G. propinquus Rathbun—Indo Pacific

KEY TO SPECIES OF THE GENUS *Bentheogennema* BURKENROAD

I. Cervical and post-cervical sutures very closely approximating each other dorsally.

B. pasithea (DeMan)—Pacific

II. Cervical and post-cervical sutures not closely approximating each other dorsally.

A. Cervical and post-cervical sutures not interrupting the post-rostral carina.

B. borealis (Rathbun)—North Pacific

AA. Cervical and post-cervical sutures interrupting the post-rostral carina.

B. intermedia (Bate)—Atlantic & Pacific

One other species ***B. stephenseni*** Burkenroad, was preliminarily described by Burkenroad 1940. He states it is closely related to ***B. intermedia*** (Bate).—"Dana" Station 3624 I.

KEY TO SPECIES OF THE GENUS *Benthesicymus* BATE[6]

"Sixteen species of the genus (not including the three added in the present paper) have been described, the validity of only seven of which is certain. Aside from the lack of exact knowledge of intraspecific variation which is responsible for the difficulties of synonymy, scant information has been available even as to the differences between the seven clearly distinct species or superspecies. Disregarding for the present the question, whether the ***Benthesicymus brasiliensis*** and ***B. crenatus*** groups contain one or many species, the structural relationships within the genus may be described as follows:

Synopsis of the Genus Benthesicymus

Group I. Thelycum without well-defined receptacles between the twelfth and thirteenth sternites, the scutes of the twelfth and thirteenth sternites being simple and unexpanded. Distoventral lobe of the petasma separated from the distolateral by a deep notch. Median margin of the petasma unarmed, the cincinnuli being borne on a ridge extending up the anterior face of the organ. Exopod of the first maxillipede narrowing abruptly to the segmented distal portion. Merus of the second maxillipede expanded, less than three times as long as broad (except in ***B. strabus,*** n. sp.). Dactyl of third maxillipede triangular, with no more than one strong spine at the tip. Exopodites of the walking legs small but easily perceptible. Pterygostomian spine, in lateral veiw, placed at the margin of the carapace. Pterygostomian carina not sharp.

IA. Posterolateral margins of the fourth pleonic tergite without a comblike series of strong serrae. Antennal carina strong. Cardiacobranchial carina turning ventrally in its posterior part, ending below the posterolateral shoulder of the carapace. First chelipeds without a slender, well-defined tooth at distal ends of basis and ischium.[7]

IA1. Hepatic tooth present. Pterygostomian carina very weak, and not extending posteriorly as far as the level of the hepatic buttress. A moderately strong tooth on the ventrolateral margin of the sixth pleonic segment, just anterior to the postero-ventral angle. Tooth of the first pelonic sternite small or absent. Merus of second maxillipede only moderately expanded, more than two and one-half times as long as broad.[8] ***B. brasiliensis*** Bate and related forms (cf. ***B. cereus***).

IA2. Hepatic tooth absent. Pterygostomian carina obtuse but well-defined, and extending far behind the level of the hepatic buttress. No tooth on the ventrolateral margin of the sixth pleonic segment. Tooth of the first pleonic sternite very strong. Merus of second maxillipede considerably expanded, only about twice as long as broad. ***B. carinatus*** Smith

IB. Posterolateral margins of the fourth pleonic tergite with a comblike series of strong serrae. Antennal carina absent. Cardiaco-branchial carina not turning ventrally at its posterior end, terminating at the level of the posterolateral shoulder of the carapace. First cheliped armed on basis and ischium.

Hepatic tooth absent. Pterygostomian carina very weak, and not extending posteriorly as far as the level of the hepatic buttress. A strong tooth on the ventrolateral margins of the sixth pleonic segment. Tooth of the first pleonic sternite very strong. Merus of second maxillipedes strongly expanded, less than twice as long as broad. ***B. crenatus*** Bate[9] and related forms

Group II. Thelycum with well-defined cavities between the twelfth and thirteenth sternites, the scute of the thirteenth sternite being broadly expanded to overlap the sternal surface proper. Distoventral and distolateral lobes of the petasma not sharply separated. Median margin of the petasma cincinnulated. Exopod of the first maxillipede tapering gently to the tip. Merus of the second maxillipede unexpanded, not less than three and one-half times as long as broad. Dactyl of third maxillipede subrectangular, the distal margin bearing more than one strong spine. Exopodites of the walking legs very minute. Pterygostomian spine, in lateral view, set behind the margin of the carapace. Pterygostomian carina very sharply defined.

IIA. Ocular peduncle not much longer than the cornea is broad; ocular tubercle situated near distal end of median margin of peduncle. Scute of the thirteenth sternite of the female posteriorly overlapping the fourteenth sternite, anteriorly not projecting free in the midline. Dis-

[6]All of the following material relative to *Benthesicymus* is copied direct from Burkenroad 1936, pages 23 to 25, 45, 46.

[7]In all of these features the two species of Section IA agree with Group II, except that the antennal carina is there weaker, though variable (ranging in strength from moderate in *B. bartletti* to absent in *B. investigatoris*).

[8]In all of these features, the *B. brasiliensis* complex differs from the species of Group II, although in degree of expansion of merus of second maxillipede it approaches Group II more closely than do the other species of Group I.

[9]Diagnosis derived from an Hawaiian male, which differs from Bate's description in several of the features mentioned (see succeeding paragraphs).

[10]The more median part of the distoventral lobe, which in the Benthesicymae surmounts the more lateral portion of the lobe.

toventral *projection*[10] of the petasma not rising much above the distoventral *flap*.[11]

Accessory lobe of the petasma rudimentary. Fifth and sixth pleonic tergites with a short strong tooth at the posterior midmargin.

B. investigatoris Alcock and Anderson

IIB. Ocular peduncle about twice as long as the cornea is broad; ocular tubercle at or proximal to the middle of the median margin of the peduncle. Posterior margin of the scute of thirteenth sternite of the female not overlapping the fourteenth; anterior part projecting free in the midline. Distoventral projection of the petasma rising considerably above the distoventral flap.

IIB1. Distoventral lobe of the petasma not rising very high above the distolateral; accessory lobe fairly well developed and with denticulate margin. Fifth and sixth pleonic tergites not terminating in a tooth; posterior margin of the sixth tergite upturned.

B. altus Bate

IIB2. Distoventral lobe of the petasma rising conspicuously above the distolateral as a slender projection; accessory lobe very weak.

IIB2a. Fifth and sixth pleonic tergites with a short, strong tooth at the posterior midmargin. ***B. tanneri*** Faxon.

IIB2b. Fifth pleonic tergite with a long slender tooth springing from the middle of its length; sixth pleonic tergum armed very weakly or not at all. ***B. bartletti*** Smith."

"Key to the Species of the B. brasiliensis *Complex*

I. Posterior margin of the fourth pleonic tergite armed with a tooth. Posterior rostral tooth usually behind the level of the orbital margin.

IA. Posterior margin of the third pleonic tergite armed with a tooth; tooth of the fourth tergite not greatly enlarged. Interval between penultimate and antepenultimate lateral spines of the telson more than twice as great as that between penultimate and ultimate pairs. Anterior blade of appendix masculina not broadest at the base.

B. brasiliensis Bate

Figures 2 and 3, p. 31; 14, 15 and 16, p. 36; 21, p. 37; 26, p. 39; 31, p. 40; 38, p. 41.

[11]The distal end of the lateral margin of the petasma, in Benthesicymae separated from the distoventral projection by a more or less conspicuous notch; in *Metapenaeopsis* greatly produced to form a spiral coil (cf. Burkenroad, 1934 b).

IIB. Posterior margin of the third pleonic tergite unarmed; tooth of the fourth much larger than that of the succeeding tergites. Interval between penultimate and antepenultimate less than one and one-half times as great as that between penultimate and ultimate spines. Anterior blade of appendix masculina very wide at base.

B. urinator, n. sp.

Figures 4 and 5, p. 31; 9, p. 35; 17 and 18, p. 36; 32 and 33, p. 40; 39 and 40, p. 41; and 45, p. 42.

II. Posterior margin of the fourth pleonic tergite unarmed. Posterior rostral tooth usually anterior to the level of the orbital margin.

IIA. Merus of the second maxillipede more than three and one-half times as long as broad. Cornea nearly as broad as the ocular peduncle is long; ocular tubercle nearly at level of the proximoventral corneal margin. Posterior blade of the appendix masculina distally much expanded.

Posterior margin of the sixth pleonic tergite armed with a tooth. Interval between the proximal lateral spine and the distalmost of the basolateral emarginations of the telson less than the interval between the distal and the penultimate emarginations.

B. strabus, n. sp.

Figures 10, p. 35; 23, p. 37; 27, p. 39; 34, p. 40; 41, p. 41; 46, p. 42; 49, p. 43.

IIB. Merus of the second maxillipede less than three times as long as broad. Cornea not nearly so broad as ocular peduncle is long; ocular tubercle far proximad the cornea. Posterior blade of the appendix masculina not considerably expanded at the tip.

IIB1. Posterior margin of the sixth pleonic tergite armed with a tooth. Breadth of antennal scale usually less than one-third the length. Interval between proximal lateral spine and the distalmost of the basolateral emarginations of the telson usually less than one and one-third times the interval between the distal and the penultimate emarginations. ***B. cereus,*** n. sp.

For list of figures see p. 30.

IIB2. Posterior margin of the sixth pleonic tergite unarmed. Breadth of antennal scale usually more than one-third third the length. Interval between proximal spine and distal emargination usually more than one and one-

third times the interval between the distal and the penultimate emarginations.

B. iridescens Bate

Figures 7, p. 31; 13, p. 35; 20, p. 36; 25, p. 37; 29 and 30, p. 39; 36 and 37, p. 40; 43 and 44, p. 41; 48, p. 43."

DISTRIBUTION OF SPECIES OF THE GENUS *Benthesicymus*

B. brasiliensis Bate (Atlantic)
B. urinator Burkenroad (Indo Pacific)
B. strabus Burkenroad (South Pacific)
B. cereus Burkenroad (Atlantic-Pacific)
B. iridescens Bate (Atlantic-Pacific)
B. carinatus Smith (Atlantic-Pacific)
B. crenatus Bate (Atlantic-Indo Pacific)
B. investigatoris Alcock & Anderson (Indo Pacific)
B. altus Bate (Atlantic-Pacific)
B. tanneri Faxon (Pacific America)
B. barletti Smith (Atlantic-Pacific)

KEY TO GENERA OF SERIES ARISTEAE BOUVIER

I. Hepatic spine present.
  A. Podobranch on twelfth and epipodite on thirteenth reduced to a rudiment or absent.

Hepomadus Bate

  AA. Podobranch on twelfth and epipodite on thirteenth well developed.

Aristaeomorpha Wood-Mason

II. Hepatic spine absent.
  A. Epipodite on XIII. Podobranch present on XII although it may be rudimentary.
    a. Epipodite on XIII rudimentary. A small podobranch on XII.

Hemipenaeus Wood-Mason

    aa. Epipodite on XIII large. Podobranch on XII large. Rostrum tridentate.

Plesiopenaeus Bate

  AA. Epipodite absent from XIII. No podobranch on XII.

Aristaeus Duvernoy

KEY TO SPECIES OF THE GENUS *Hepomadus* BATE

I. Fourth and fifth pleonic somites with teeth at posterior ends of dorsal carinae.

H. glacialis Bate—Pacific

II. Fourth and fifth pleonic somites without teeth at posterior ends of dorsal carinae.

H. tener Smith—Atlantic

THE GENUS *Aristaeomorpha* WOOD-MASON

Possibly only one species, ***A. foliacea*** (Risso), which may be identical with ***A. rostidentata***—Atlantic & Pacific.

KEY TO SPECIES OF THE GENUS *Hemipenaeus* BATE

I. No large spine springing from the third pleonic tergum.

H. speciosus Bate—Southern South Atlantic

II. A large spine springing from the third pleonic tergum.
  A. Rostrum short being less than one-fifth as long as the carapace and not reaching the end of the eye.

H. carpenteri Wood-Mason—Indo Pacific and Atlantic

  AA. Rostrum at least one-fifth as long as its carapace and reaching end of eye.

H. spinidorsalis Bate—Indo Pacific and Atlantic

Three other species in the genus:
1. ***H. crassipes*** Wood-Mason—Indo Pacific.
2. ***H. gracilis*** Bate—Indo Pacific.
3. ***H. sibogae*** DeMan—East Indian Archipelago.

KEY TO SPECIES OF THE GENUS *Plesiopenaeus* BATE

I. Second maxilliped with exopod nearly twice as long as the endopod.

P. edwardsianus (Johnson).—Atlantic and Pacific

II. Second maxilliped with exopod either shorter or not much longer than the endopod.
  A. Second maxilliped with exopod not much longer than the endopod. Merus of first legs with mobile spine. Basis and ischium of first legs without fixed tooth.

P. coruscans (Wood-Mason).—Atlantic and Pacific

  AA. Second maxilliped with exopod considerably shorter than the endopod. Merus of first and second legs with mobile spine. Ischium of first legs with strong tooth.

P. armatus (Bate).—Atlantic and Pacific

THE GENUS *Aristaeus* DUVERNOY

Evidently 5 species are included:
A. antillensis Bouvier—West Atlantic.
A. antennatus (Risso)—Mediterranean and East Atlantic.
A. occidentalis Faxon—West Coast of Central America.
A. semidentatus Bate—Indo Pacific.
A. virilis Bate—Indo Pacific.

KEY TO GROUPS OF THE SUB-FAMILY PENAEINAE

I. A pleurobranch on the fourteenth somite. Epipodite present on the third maxillipeds. Ventral rostral teeth in many or all of the species of all genera.

Penaeus group

II. No pleurobranch on the fourteenth somite. No epipodite on the third maxillipeds. No ventral rostral teeth.

A. A distal fixed pair of spines on the telson and one to three pairs of mobile lateral spines. Basal segment of antennular peduncle with a spine on its median border.

Parapenaeus group

AA. No distal fixed pair of spines on the telson, although mobile lateral spines may be present. No spine on median border of basal segment of antennular peduncle.

a. Exopods of walking legs absent behind tenth somite. No spines on the distomedian margins of basis or ischium of anterior legs.

Macropetasma group

aa. Exopods of walking legs present behind tenth somite. Spines present on the distomedian margins of basis or ischium of anterior legs.

Trachypenaeus group

KEY TO GENERA OF THE PENAEUS GROUP

I. Anteroinferior angle of carapace dentiform. Telson armed with three pairs of fixed spines. Telson, carapace and pleon covered by dense pubescence. External margin of uropodal exopods with strong tooth proximad the tip.

Funchalia Johnson

II. Anteroinferior angle of carapace not dentiform. Telson not armed with fixed spines but when armed, with three pairs of mobile lateral spines. Telson, carapace and pleon not covered with dense pubescence. External margin of uropodal exopods without strong tooth proximad the tip.

Penaeus Fabricius

One other genus, ***Heteropenaeus*** DeMan, consisting of possibly only one species, ***H. longimanus*** DeMan, occurs in the East Indian Archipelago. The genus is very closely allied to ***Penaeus*** and with the literature at hand separation was not possible.

KEY TO SPECIES OF THE GENUS *Funchalia* JOHNSON

I. Rostrum with ventral armature. Antennal angle unarmed.
Sub-genus ***Pelagopenaeus*** Burkenroad

One species, ***Funchalia (Pelagopenaeus) balboae*** (Faxon), Atlantic and Pacific.

II. Rostrum without ventral armature. Antennal angle armed.
Sub-genus ***Funchalia***

A. With hepatic tooth. Rostrum armed with 10+1 to 12+1 dorsal teeth.

a. Ridge posterior to pterygostomian spine rather short being about five times the length of the spine.
F. danae Burkenroad—"Dana" Station 4017 VII

aa. Ridge posterior to pterygostomian spine rather long being about ten times the length of the spine.
F. woodwardi Johnson—North and South Atlantic

AA. Without hepatic tooth. Rostrum armed with 5+1 to 6+1 dorsal teeth.

a. Carapace with frontal margin sloping posteriorly ventral of pterygostomian spine.
F. taaningi Burkenroad—"Dana" Station 3920 III

aa. Carapace with frontal margin sloping vertically or possibly anteriorly ventral of pterygostomian spine.
F. villosa (Bouvier)—Eastern and Western North Atlantic, South Atlantic and Caribbean

KEY TO SPECIES OF THE GENUS *Penaeus* FABRICIUS

I. Lateral rostral sulci not reaching almost to the posterior margin of the carapace; postocular crest absent.

A. Species limited to Atlantic America.

a. Ventral margin of pleuron of first pleonic somite almost straight. Anterolateral marginal ridges of XIV sternite of female extending conspicuously mediad near middle of segment making interrupted crescentic transverse ridge with concavity directed forward. Posterior portion of XIV sternite of female with conspicuous pair of fleshy protuberances. Posterior margin of XII sternite of female with pair of lateral convexities which extend almost level with median portion of the margin. Petasma of male with diagonal ridge across ventral face of distolateral lobe.[12]
P. setiferus (Linn)—Atlantic, North America

[12]From Burkenroad, 1936b.

aa. Ventral margin of pleuron of first pleonic somite distinctly concave. Anterolateral marginal ridges of sternite XIV of female not extending conspicuously mediad near middle of segment. Pair of longitudinal ridges on anterior part of XIV. Posterior portion of sternite XIV of female without conspicuous pair of fleshy protuberances. Posterior margin of XII sternite of female with pair of lateral convexities which project well beyond median portion of margin. Petasma of male without diagonal ridge across ventral face of distolateral lobe.[3]

P. schmitti Burkenroad—Atlantic, South America

AA. Species limited to Pacific America.

a. Posterior ventral rostral tooth directly below or in advance of anterior dorsal rostral tooth. Lateral rostral carinae extending not further than front of posterior dorsal carapacic spine. Rostral teeth generally 9/2. Thelycum of females not densely pubescent; two ventrally projecting flattened plates on the anterior portion of the sternum of somite 14. Coxae of fifth legs of female not medially produced as projecting flaps.

P. vannamei Boone

aa. One or more posterior ventral rostral teeth behind anterior dorsal rostral tooth. Lateral rostral carinae extending behind front of posterior dorsal carapacic tooth. Rostral teeth usually 8-11/3-5. Thelycum of females without two ventrally projecting plates on the anterior portion of the sternum of somite XIV.

1. Rostral teeth generally 8/4-5. Antennular flagella longer than peduncle. Males with well spaced spines on mid-dorsal surface of inferior antennular flagella. Female with prominent ventrally produced median triangular-shaped protuberance on sternum of somite XIV. Coxae of third, fourth and fifth legs of female with large medially produced flaps. Thelycum of female not densely pubescent.

P. styllirostris Stimpson

2. Rostral teeth generally 10-11/3-5. Antennular flagella equal to or shorter than peduncle. Males with close-set spines on externolateral margin of inferior antennular flagella. Females without prominent ventrally produced median triangular-shaped protuberance on sternum of somite XIV. Coxae of third, fourth and fifth legs of female not greatly produced medially. Thelycum of female densely pubescent.

P. occidentalis Streets

AAA. Species limited to Indo Pacific and East Coast of Africa.

a. A more or less prominent subhepatic crest on the carapace.

1. Fifth pair of legs without exopodites:

a′. Antennular flagella somewhat shorter than peduncles. Occurs in Indo Pacific around Singapore.

P. carinatus Dana

a′a′. Antennular flagella somewhat longer than peduncles. Occurs on East Coast of South Africa at about 33° S. latitude.

P. caeruleus Stebbing

2. Fifth pair of legs possessing small exopodites.

a′. With sulcate postrostral carina.

P. semisulcatus De Haan

a′a′. Without sulcate postrostral carina or grooves.

P. esculentus Haswell

aa. No subhepatic crest on the carapace.

1. Rostral crest of moderate heighth.

P. indicus H. Milne Edwards

2. Rostral crest high and assuming a triangular shape.

P. merguiensis DeMan

3. Rostral crest high but not assuming a triangular shape.

P. penicillatus Alcock

II. Lateral rostral sulci reaching almost to the posterior margin of the carapace; postocular crest present.

A. Species limited to Mediterranean and Eastern and Western Atlantic.

a. Coxae of chelipeds armed.

P. trisulcatus Leach—Mediterranean and Eastern Atlantic

aa. Coxae of chelipeds unarmed.

1. Anteromedial corners of lateral plates of adult thelycum extended, meeting medially and covering completely posteriomedian part of median plate of XIII. Median carina on median plate of XIII absent. Tip of distoventral lobe of male petasma projecting.

P. brasiliensis Latreille—Atlantic, North and South America, but not from Gulf of Mexico

2. Anteromedial corners of lateral plates of adult thelycum not extended, not converging medially nor covering carina of posteriomedian part of median plate of XIII. Carina present on median plate of XIII. Tip of distoventral lobe of male petasma not projecting.

a′. External edge of distoventral lobes of male petasma armed with 2-12, usually 4-7 spinules. Carina of

posteriomedian elevation of median plate of XIII not bifurcate.

P. duoarum Burkenroad—Atlantic, North America and West Africa, also Gulf of Mexico

a′a′. Spines absent from external edge of distoventral lobe of male petasma. Carina of posteriomedian elevation of median plate of XIII bifurcate.

P. aztecus Ives—Gulf of Mexico; Atlantic, North and South America

AA. Species limited to Pacific America. Postocular crest not turning upon itself at posterior end forming more or less of a loop. Rostrum with more than one ventral tooth. Telson unarmed.

a. Carina of posterodorsal margin of antennal sulcus reaching to within not more than 3/5 its length of the orbital angle. Thelycum of female without median longitudinal carina on XIII and being cup shaped; lateral plates of XIV not meeting in the midline for their entire length, their anterior ends do not overlie and conceal the posterior elevation of XIII; ventral surface of lateral plates pubescent. In male petasma, "the medially directed distal ends of the lateral ribs terminate in a blunt tip not projecting free of the median membranes; this tip is armed on its distolateral or free edge with one or two conspicuous axially-directed teeth. . . . The proximomedian margin of the anterior, or dorsal side of the distal parts of lateral ribs bears a row of 8 to 11 spines along its juncture with the membraneous median parts of the petasma. The folded distal edge of the median parts, at the point of juncture with the tip of the lateral rib, does not project inward as a conspicuous fleshy flap, and is here unarmed."[13] Outer margin of appendix masculina of second male pleopods with pronounced curve.

P. brevirostris Kingsley

aa. Carina of posterodorsal margin of antennal sulcus reaching to within about half its length of the orbital angle. Thelycum with median longitudinal carina on XIII. "The lateral plates of XIV meet in the midline for their entire length, their anterior ends thus overlying and concealing the posterior part of the elevation of XIII."[14] Ventral surface of lateral plates not pubescent. "The medially curved distal ends (distoventral lobes) of the heavily chitinized lateral ribs of the petasma terminate in a sharply pointed recurved tip which is free from the membranes forming the median parts of the petasma";[15] proximomedian margin of the anterior, or dorsal side of the distal parts of the lateral ribs unarmed along its juncture with the median or membraneous parts of the petasma; the folded distal edge of the median parts, at point of juncture with the tip of the lateral rib, projecting inward as a conspicuous fleshy flap which is armed with several series of spines. Outer margins of appendix masculina of second male pleopods straight or nearly so.

P. californiensis Holmes

AAA. Species limited to Indo Pacific. Postocular crest turning upon itself at posterior end forming more or less of a loop. Rostrum with but one ventral tooth (except ***P. marginatus*** Randall). Telson armed laterally with three pairs of mobile spines (except ***P. canaliculatus*** Olivier).

a. Telson not armed with mobile spines

P. canaliculatus Olivier

aa. Telson armed with three pairs of mobile spines.

1. Ischium of first leg armed.

P. marginatus Randall

2. Ischium of first leg unarmed.

a′. "Lateral grooves on carapace paralleling medially sulcate post-rostral carina to posterior margin of carapace.

1′. Rostrum without a secondary or accessory pair of lateral rostral sulci.

a″. Thelycum tubular (oval in cross-section), the two lateral plates being indistinguishably united on the median line to form a single large plate. Petasma with submedian teeth or "horns" bent over, so as to overhang the distal margin of the side plates of the petasma.

P. japonicus, Bate

a″a″. Thelycum composed of two distinct plates, juxtaposed, but not united on the median line. Petasma with submedian teeth or protuberances but slightly bent over, and not overhanging the distal margin of the side plates of the petasma.

P. latisulcatus, Kishinouye

2′. Rostrum with a secondary pair of lateral carinae subtending an accessory pair of lateral sulci on the sides of the upper blade of the rostrum, not extending backward behind the last rostral (gastric) tooth. Thelycum and petasma much as in ***P. latisulcatus.***

P. plebejus, Hess

[13]Burkenroad, 1938, page 71.
[14]Burkenroad, 1938, pages 70, 71.
[15]Burkenroad, 1938, page 71.

a'a'. Lateral grooves on carapace posteriorly confluent, uniting behind the sulcated postrostral carina and crossing over to form an X-shaped depression.
P. maccullochi, Schmitt"[16]

THE GENUS *Heteropenaeus* DEMAN

One species, ***H. longimanus*** DeMan, occurs in the East Indian Archipelago.

KEY TO GENERA OF THE PARAPENAEUS GROUP

I. Somite 13 with a small filamentose anterior arthrobranch. Exopods absent behind ninth somite. No spines on the distomedian margins of basis or ischium of anterior legs.
Artemesia Bate

II. Somite 13 without a small filamentose anterior arthrobranch. Exopods present behind ninth somite. Spines present on the distomedian margins of basis or ischium of anterior legs.
A. Carapace with longitudinal and transverse sutures present. Rudimentary arthrobranch of somite 7 without filaments.
Parapenaeus Smith

AA. Carapace without longitudinal and transverse sutures. Arthrobranch of somite 7 filamentous.
Penaeopsis Bate

THE GENUS *Artemesia* BATE

Probably only one species, ***A. longinaris*** Bate.

KEY TO SPECIES OF THE GENUS *Parapenaeus* SMITH

I. Species limited to the Atlantic.
A. Branchiostegal spine placed behind anterior margin of carapace. Rostral teeth usually 7. Epigastric and hepatic teeth not as far behind orbital margin as in ***P. americanus.***
P. longirostris (Lucas). (Occurs in Gulf of Mexico and on European and American sides of Atlantic.)

AA. Branchiostegal spine placed on anterior margin of carapace. Rostral teeth usually 6. Epigastric and hepatic teeth placed farther behind orbital margin than in *P. longirostris.*
P. americanus Rathbun. (Reported from Caribbean.)

II. Species occurring in the Indo Pacific.
A. Carapace without spine on the anteroinferior region.
P. longipes Alcock

[16]Schmitt, 1926, page 359.

AA. Carapace with spine on the anteroinferior region.
a. Branchiostegal spine placed behind anterior margin of carapace.
P. investigatoris Alcock and Anderson

aa. Branchiostegal spine placed on anterior margin of carapace.
P. fissurus Bate

KEY TO SPECIES OF THE GENUS *Penaeopsis* BATE

I. "*Penaeopsis* Bate, sensu stricto. Petasma symmetrical. Vestigial anterior arthrobranch of somite XIII absent."[17]
Sub-genus ***Penaeopsis*** Bate ss

A. Species limited to Atlantic.
P. megalops (Smith)

AA. Species limited to Indo Pacific.
Two species, ***P. serratus*** Bate and ***P. rectacutus*** Bate. These two species, do not appear to have been satisfactorily separated.

II. "*Metapenaeopsis* Bouvier, 1905 a, redefined. Petasma asymmetrical. Vestigial anterior arthrobranch of somite XIII present (save in ***P. lamellatus*** (DeHaan) according to Schmitt, 1926 a). Type, ***Penaeopsis (Metapenaeopsis) pubescens*** (Bouvier)."[18]

A. "External piece (distoventral projection) of the left petasmal endopod reduced to a rudiment. Known distribution limited to the Atlantic and the American Pacific."[19]
a. Species limited to the American Atlantic.
1. Adult petasma; "*P. smithi*—Right distoventral projection deeply cleft into two subequal lobes. Left endopod not extending nearly as far distad as does the right distomedian lobe. Inner part of the distolateral lobe a blunt vertical cone (not extending much above the level of the distomedian lobe) joined to the dorsolateral edge of which is a projection which does not rise above the level of the cone. Spinules are placed on the distal surface of the projection in the region where it joins the cone. At the base of the left endopod, laterad the projecting median spur, is a low rounded prominence."[20] Adult female with median plate of sternum of somite XIII containing two spiral pits.
P. (Metapenaeopsis) smithi Schmitt

[17]Burkenroad, 1934,b, page 8.
[18]Burkenroad, 1934b, page 8.
[19]Burkenroad, 1934b, page 8.
[20]Burkenroad, 1934b, page 25.

2. Adult petasma; "*P. goodei*—Right distoventral projection less deeply cleft, the left lobe usually smaller than the right. Left endopod extending nearly as far distad as does the right distomedian lobe. Inner part of the distolateral lobe a greatly produced slender clavate projection rising far above the level of the distomedian lobe, and bearing spinules upon its distal surface. Laterad the median spur at the base of the left endopod is a long slender tooth, visible even in dorsal view."[21] Thelycum of adult female without spiral pits on median plate of somite XIII.

P. (Metapenaeopsis) goodei Smith

aa. Species limited to American Pacific.

1. Basis of second leg unarmed.

P. (Metapenaeopsis) kishinouyei (Rathbun)

2. Basis of second leg usually armed.

a′. Rostral teeth usually 9+1 or 8+1.

P. (Metapenaeopsis) beebei Burkenroad

a′a′. Rostral teeth usually 11+1 or 10+1.

P. (Metapenaeopsis) mineri Burkenroad

Burkenroad 1938 gives differences between secondary sexual organs of these three American Pacific forms.

AA. "Distolateral projection of the left petasmal endopod as large as or larger than the right one. Known distribution limited to the Indopacific. Species grouped by Kishinouye, 1929, as follows: (*Leptopenaeus*) *P. philippii* Bate [with which *P. coniger andamensis* (Wood-Mason and Alcock) and *P. philippinensis* (Bate) are synonymous, Calman, 1923], *coniger* Wood-Mason and Alcock, *sibogae* DeMan, *distinctus* DeMan. (*Ceratopenaeus*) *P. dalei* Rathbun, *mogiensis* Rathbun (with which *P. hilarulus* DeMan is synonymous, Schmitt, 1926 a), *lamellatus* DeHaan, *borradalei* DeMan. (*Erythropenaeus*) *P. acclivis* Rathbun, *barbatus* DeHaan (with which *P. akayebi* Rathbun is synonymous, DeMan, 1911). Other named Indopacific species probably of the section are: *P. assimilis* DeMan, *bateï* Miers, *commensalis* Borradaile, *consobrinus* Nobili, *evermanni* Rathbun, *gallensis* Pearson, *gracilis* Dana, *longipes* Paulson, *novae-guineae* Haswell [with which *P. stridulans* (Alcock) is synonymous, Schmitt, 1926 a], *perlarum* Nobili, *quinquedentatus* DeMan, *vaillanti* Nobili, *velutinus* Dana."[22]
No attempt is made to key out these species.

[21] Burkenroad, 1934b, page 25.
[22] Burkenroad, 1934b, page 8.

THE MACROPETASMA GROUP

Only one genus, ***Macropetasma*** Stebbing.

KEY TO GENERA OF THE TRACHYPENAEUS GROUP

I. Pleurobranch present on thirteenth somite. Exopodite absent from fifth leg only.

Metapenaeus Wood-Mason and Alcock

II. Pleurobranch absent on thirteenth somite. Exopodite not absent from fifth leg only.

A. Exopodite absent from second maxilliped. Three anterior legs with very weak chelae, having short fingers and much lengthened palm.

Protrachypene Burkenroad

AA. Exopodite present on second maxilliped. Three anterior legs not having chelae as above.

a. Dactyls of last two pereiopods elongate and subdivided.

Xiphopenaeus Smith

aa. Dactyls of last two pereiopods not elongate and subdivided.

1. Longitudinal and transverse sutures absent from carapace.

Trachypenaeopsis Burkenroad

2. Longitudinal or transverse sutures or both present on carapace.

a′. Antennal spine without buttress at its base. Spine on basis of third legs. Transverse suture present on carapace.

Atypopenaeus Alcock

a′a′. Antennal spine with buttress at its base. Spine absent from basis of third legs (except in female of ***Parapenaeopsis*** *maxillipedo* Alcock which species, however, has a longitudinal suture on carapace).

1′. Epipodites absent from third pereiopods.

Parapenaeopsis Alcock

2′. Epipodites present on third pereiopods.

Trachypeneus Alcock

GENUS *Metapenaeus* WOOD-MASON AND ALCOCK

"Known species confined to the Indopacific (save for certain migrants into the Mediterranean through the Suez Canal). Type, *Metapenaeus affinis* (H. Milne Edwards). Named species: *M. affinis* H. M. Edwards, *mutatus* Lanchester, *monoceros* Fabricius, *elegans* DeMan,

incisipes Bate, *deschampsi* Nobili, *cognatus* Nobili, *spinulicauda* Stebbing. *M. stebbingi* Nobili. *M. dobsoni* Miers, *joyneri* Miers, *brevicornis* H. M. Edwards, *lyssianassa* DeMan. *M. macleayi* Haswell, *demani* Roux. *M. ensis* DeHaan, *intermedius* Kishinouye, *intermedius anchista* DeMan, *endeavouri* Schmitt."[23]

Inasmuch as the species comprising the genus appear to be rather badly confused, no attempt is made to devise a key.

Genus *Protrachypene* Burkenroad

One known species, ***P. precipua*** Burkenroad, from Pacific America.

Key to Species of the Genus *Xiphopenaeus* Smith

Species limited to Atlantic America. ***X. kroyeri*** (Heller)

Species limited to Pacific America. ***X. riveti*** Bouvier

Key to Species of the Genus *Trachypenaeopsis* Burkenroad

Species limited to Atlantic America.
One species, ***T. mobilispinis*** (Rathbun)

Species limited to Indo Pacific.
One species, ***T. richtersii*** (Miers)

Genus *Atypopenaeus*, Alcock

Possibly only one species, ***A. compressipes*** (Henderson), occurring the Indo Pacific.

Key to Species of the Genus *Parapenaeopsis* Alcock

Epipodites present on the first and second walking legs.
A. Chelipeds without basisal armature.
  a. Epigastric tooth not present.
    P. gracillima Nobili—Indo Pacific
  aa. Epigastric tooth present.
    P. balli Burkenroad—Pacific America
AA. Chelipeds with basisal armature.
  a. Species limited to Eastern Atlantic.
    One species, ***P. atlantica*** Balss—Eastern Atlantic
  aa. Species limited to Indo Pacific.
    1. Second chelipeds without spine on the basis.
      P. uncta Alcock—Indo Pacific

[23]Burkenroad, 1934b, page 7.

2. Second chelipeds with spine on the basis.
  a′. Telson with conspicuous fixed lateral spines.
    P. stylifera (H. Milne Edwards)—Indo Pacific
  a′a′. Telson with three to five pairs of small mobile lateral spines.
    P. hardwickii (Miers)—Indo Pacific
  a′a′a′. Telson without lateral spines (except rarely in ***P. sculptilis***).
    1′. Postrostral carina not extending to near posterior end of carapace.
      P. nana Alcock—Indo Pacific
    2′. Postrostral carina extending to near posterior end of carapace.
      a″. Postrostral carina with sulcus.
        P. sculptilis (Heller)—Indo Pacific
      a″a″. Postrostral carina without sulcus.
        P. maxillipedo Alcock—Indo Pacific

        One other species, ***P. cornutus*** (Kishinouye), closely allied with ***maxillipedo*** may possibly be identical.

II. Epipodites absent from the first and second walking legs.
  A. Epigastric tooth present.
    a. Spine present on basis of second leg. Postrostral carina present.
      P. hungerfordi Alcock—Indo Pacific
    aa. Spine absent from basis of second leg. Postrostral carina absent.
      P. venusta DeMan—Indo Pacific
  AA. Epigastric tooth absent.
    Two species, ***P. tenellus*** (Ortmann) and ***P. acclivirostris*** Alcock. Indo Pacific.

Key to Species of the Genus *Trachypeneus* Alcock

I. First and second pairs of walking legs with epipods present.
  Sub-genus ***Trachysalambria*** Burkenroad
  A. Carapace with longitudinal suture reaching well behind the hepatic spine. Spine present on basis of third maxilliped. First legs with ischium unarmed. Species limited to Atlantic and Pacific America.

a. Species limited to Atlantic America.

1. Anterior margins of median plate of thelycum truncated. Lips of transverse groove of thelycum truncated. Ventral surfaces of thelycum naked. Sternal elevation between bases of fifth legs of male has lateral margins sloping regularly to the narrow posterior end. Exopodite of fifth leg does not reach to distal end of basis. Tip of telson usually tapers regularly to a point although some indication of proximal shoulder may be present. Shrimp colored with orange and red.
T. (Trachysalambria) similis (Smith)—Atlantic America

2. Anterior margins of median plate of thelycum convexly rounded. Lips of transverse groove of thelycum convexly rounded. Ventral surfaces of thelycum pubescent. Sternal elevation between bases of fifth legs of male with margins indented setting off posterior part of plate from broad anterior basal portion. Exopodite of fifth leg larger and longer than in *T. similis*. Base of terminal point of telson always enlarged into a broad shoulder from which slender distal part is well set off. Shrimp colored with lavender and chocolate.
T. (Trachysalambria) constrictus (Stimpson)—Atlantic America

aa. Species limited to Pacific America.

1. Third pleonic somite with tooth present at posterior end of mid-dorsal carina. Telson without lateral armature.
T. (Trachysalambria) byrdi Burkenroad

2. Third pleonic somite without tooth at posterior end of mid-dorsal carina. Telson with lateral armature.
T. (Trachysalambria) similis pacificus Burkenroad

AA. Carapace with longitudinal suture not reaching behind hepatic spine. No spine present on basis of third maxilliped. First legs with ischium armed.

a. Species limited to Pacific America.
One species, ***T. (Trachysalambria) brevisuturae*** Burkenroad

aa. Species limited to Indo Pacific.
One species, ***T. (Trachysalambria) curvirostris*** (Stimpson)
T. granulosus (Mier) and ***T. asper*** Alcock are probably identical with ***T. curvirostris*** (Stimpson).

I. First and second pairs of walking legs without epipods. Species limited to the Indo Pacific.
Subgenus ***Trachypenaeus***

Species of this subgenus do not appear to have been satisfactorily separated and no attempt is being made to key them out. The following species can probably be assigned to the subgenus: *T. anchoralis* (Bate), *T. granulosus* (Haswell), *T. salaco* DeMan, *T. pescadoreensis* Schmitt.

Sub-Family Eusicyoninae Burkenroad

The one genus only, ***Eusicyonia*** Stebbing.

I. Species occurring in Atlantic American waters.

A. "Antennal angle unarmed. Dorsal carina of the second pleonic somite notched dorsad the junction of the transverse sulci. Dorsal carina of the fifth pleonic somite not ending posteriorly in a tooth or sharp angle. Basis and ischium of the first chelipeds armed with a spine."[24]

a. Dorsal carina of carapace with three teeth behind orbital margin, middle of which is largest. Anterior tooth much smaller than posterior two and about equal to rostral teeth in size. Anterior tooth appears as part of rostral series. Rostrum with two teeth behind terminal portion; terminal portion divided into four teeth; one or two short mobile spines on ventrodistal end of rostrum.
Eusicyonia laevigata (Stimpson)—Atlantic and Pacific America

aa. Dorsal carina of carapace with three teeth behind orbital margin, all of about equal size and the anterior tooth considerably larger in size than those in rostral series. Rostrum with three teeth behind terminal portion; terminal portion divided into three teeth with rudiment of a fourth; no mobile spinules on ventrodistal end of rostrum.
Eusicyonia parri Burkenroad

AA. "Antennal angle armed with a buttressed spine. Dorsal carina of the second pleonic somite not incised. Dorsal carina of the fifth pleonic somite ending posteriorly in a tooth or sharp angle. Basis and ischium of the first chelipeds unarmed."[25]

a. "Postrostral carina with three or four teeth behind the orbital margin, of which two are large and placed far behind the orbit."[26]
Eusicyonia brevirostris (Stimpson)—Occurs in both Atlantic and Pacific America

aa. "Postrostral carina with two or three teeth behind the orbital margin, of which two are large and placed far behind the orbit."[27]
Eusicyonia edwardsi (Miers)

[24] Burkenroad, 1934b, page 71.
[25] Burkenroad, 1934b, page 73.
[26] Burkenroad, 1934b, page 73.
[27] Burkenroad, 1934b, page 73.

aaa. "Postrostral carina with two teeth behind the orbital margin, of which one is large and placed behind the level of the hepatic spine."[28]

1. Rostrum elevated at a considerable angle. Rudimentary third tooth appearing as a minute crestlike swelling slightly in advance of posterior tooth of carapacic carina, usually with a sharp truncated anterior edge. Lateral rostral ridge runs near to and parallel with ventral margin. Proximal median margin of depression of external surface of basal segment of mandibular palp convex inward.

Eusicyonia stimpsoni (Bouvier)

2. Rostrum extends horizontally or below horizontal. No trace of rudimentary third tooth on carapacic carina. Lateral rostral ridge slopes upward to near dorsal margin. Proximal median margin of depression of external surface of basal segment of mandibular palp convex outward.

Eusicyonia dorsalis (Kingsley)

I. Species occurring in Pacific American waters.

A. "Antennal angle unarmed. Dorsal carina of the second pleonic somite notched dorsad the junction of the transverse sulci. Dorsal carina of the fifth pleonic somite not extending posteriorly in a tooth or sharp angle. Basis and ischium of the first chelipeds armed with a spine."[29]

a. Dorsal carina of carapace with three teeth behind orbital margin, middle of which is largest. Anterior tooth much smaller than posterior two and about equal to rostral teeth in size. Anterior tooth appears as part of rostral series. Rostrum with two teeth behind terminal portion; terminal portion divided into four teeth. One or two short mobile spines on ventrodistal end of rostrum.

E. laevigata (Stimpson)—Atlantic and Pacific America

aa. Dorsal carina of carapace with three teeth behind orbital margin, all of about equal size and the anterior tooth considerably larger in size than those in rostral series. Rostrum with three teeth behind terminal portion; terminal point with four or five teeth; ventrodistal margin of rostrum with a mobile spinule.

E. disparri Burkenroad

AA. "Antennal angle armed with a buttressed spine. Dorsal carina of the second pleonic somite not incised. Dorsal carina of the fifth pleonic somite ending posteriorly in a tooth

[28]Burkenroad, 1934b, page 73.
[29]Burkenroad, 1931.

or sharp angle. Basis and ischium of the first chelipeds unarmed."[30]

a. "Postrostral carina with three or four teeth behind the orbital margin, of which three are large and placed far behind the orbit."[31]

E. brevirostris (Stimpson)—Atlantic and Pacific America

aa. "Postrostral carina with two or three teeth behind the orbital margin, of which two are large and placed far behind the orbit."[32]

1. Rostrum with two teeth behind the bifurcated tip (this does not include the anterior tooth of the carapace which sometimes appears forward of the orbital margin). Pair of median stylets on ocular somite divergent, with a rather conspicuous bend near the tips.

E. disedwardsi Burkenroad

2. Rostrum with one tooth behind the bifurcated tip (Burkenroad 1938 stated that about one individual in ten bears two teeth). Pair of median stylets on ocular somite bent only slightly if at all.

E. penicillata (Lockington)

AAA. "Postrostral carina with two teeth behind the orbital margin, of which one is large and placed behind the level of the hepatic spine."[33]

a. Posterior tooth of carapace very large and placed very near to posterior margin of carapace to which it slopes as a high carina.

1. First pleonic somite with shallow anteromedian pleural sulcus reaching only about one-fourth the distance from point of origin to ventral edge. Pleonic surface smooth, although it is punctate and setose.

E. affinis (Faxon)

2. First pleonic somite with deep anteromedian pleural sulcus reaching close to ventral margin and meeting posteromedian pleural sulcus. Pleonic surface tuberculate and somewhat wrinkled.

E. alliaffinis Burkenroad

aa. Posterior tooth of carapace larger than anterior tooth but not extremely so and placed well in advance of posterior margin of carapace.

[30]Burkenroad, 1934b, page 73.
[31]Burkenroad, 1934b, page 73.
[32]Burkenroad, 1934b, page 73.
[33]Burkenroad, 1934b, page 73.

1. Dorsal carina posterior to last tooth of carapace a high crest. Rostrum with four teeth and a trifurcate tip. Rostrum elevated at a considerable angle.
E. picta (Faxon)

2. Dorsal carina posterior to the last tooth of carapace, although clearly marked is low. Rostrum with three teeth and a bifurcate tip. Rostrum extends almost horizontally to below horizontal with a decurved tip.
a′. Telson armed with a conspicuous pair of fixed lateral spines. Telson exceeding uropods. Rostrum with lateral ridge paralleling ventral margin for its entire length.
E. ingentis Burkenroad

a′a′. Telson armed with a very small inconspicuous pair of fixed lateral spines. Telson shorter than uropods. Rostrum with lateral ridge arching up from ventral margin close to the distal end.
E. disdorsalis Burkenroad

II. Species occurring in Eastern Atlantic and Mediterranean.
One species, ***E. carinata*** (Olivier).

V. Species occurring in the Indo Pacific.

E. benthophila (DeHaan)	***E. fallax*** (DeMan)
E. ocellata (Stimpson)	***E. trispinosa*** (DeMan)
E. rectirostris (DeMan)	***E. bispinosa*** (DeHaan)
E. parvula (DeHaan)	***E. cristata*** (DeHaan)
E. laevis (Bate)	***E. furcata*** (Miers)
E. curvirostris (Balss)	***E. japonicus*** (Balss)

E. lancifer (Olivier)

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